REMARKS

In the previous Final Rejection and Advisory Action Claims 1-37 were examined and rejected. Claims 38-48 have been previously been canceled. Applicants amend claims 1, 18, 30 and 31. Applicants assert that no new matter is added herein. A semiconductor material that consists essentially of a semiconductor material for use in a photoconductor is supported at paragraphs 8, 26-28, and 34-35, of the application as originally filed (e.g., in paragraph 34 the band gaps given for materials are for materials that consists essentially of the specific semiconductor materials, such as mercuric iodide and lead iodide semiconductor material; also the deposition processes mentioned in paragraph 35 may form materials that consists essentially of a specific semiconductor materials). Applicants respectfully request reconsideration of claims 1-37, as amended, in view of at least the following remarks.

I. Claim Rejections Under 35 U.S.C § 112

The Patent Office rejects claims 1 through 37 under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement with respect to the prior amendments addition of "one or more of the first and second semiconductor materials forming a film comprising attached halide particles extending along the heterojunction," to claims 1 and 17; and "wherein at least one of the first and second semiconductor materials comprises a substantially solid phase film," to claims 30 and 31.

Applicants respectfully disagree and submit that claims 1 and 17 comply with the written description requirement as the limitations noted above have been removed from those claims. Hence, Applicants respectfully requests the Patent Office withdraw the rejection above. Although Applicants amend the claims, Applicants do not agree with the prior §112 rejection mentioned above.

II. Claims Rejected Under 35 U.S.C. §§ 102 and 103

The Patent Office rejects claims 1-9, 14, 16-18, and 20-37 under 35 U.S.C. §§ 102(b) and 103(a) as being anticipated by and obvious over WO 02/067014 to Harel et al. (Harel). It is axiomatic that to be anticipated, every limitation of a claim must be

disclosed within a single reference. Also, to render a claim obvious, all limitations of that claim must be taught or suggested by at least two properly combined references.

Applicants respectfully disagree with the rejection above of claim 1, as amended, for at least the reason that the cited references do not teach or suggest a photodetector comprising a heterojunction formed of two semiconductor materials, being halides, wherein at least one of the first and second semiconductor materials consist essentially of a semiconductor material, as required by amended claim 1. According to claim 1, for example and without providing limitation thereto, one of the two materials that form the heterojunction is a semiconductor material, excluding other elements from having any essential significance to the semiconductor material, i.e. excluding other elements that do not materially affect the basic and novel characteristics of the semiconductor material.

On the other hand, Harel teaches producing wide band gap semiconductor particle-in-binder (PIB) composite detectors having particulate semiconductors combined with polymeric binders. (See page 4, lines 1-3) Specifically, Harel describes grains of mercuric iodide powder mixed with a binder, such as acrylic, ester derivatives, rubber, polymers, etc. (See page 19-20, lines 6-7) The material is mixed thoroughly to wet all of the particles of mercuric iodide powder and to obtain a homogenous mixture (see page 20, lines 6-7) which is then applied to an adhesive coated substrate by screen printing die pressing, doctor blade, slot coater, or Mayer rod (see page 20, lines 8-16; page 14, lines 9-11; and page 15, lines 15-18). Moreover, Harel teaches a photoconducting hybrid bi-layer detector plate 10 having a primary layer of mercuric iodide (5) over a buffer layer of lead iodide (4) (see page 30).

However, the Patent Office has not identified and Applicants are unable to find any description in Harel that teaches or suggests a heterojunction of at least one semiconductor materials that consists essentially of a semiconductor material, as required by amended claim 1. As known in the art, such a semiconductor material has a band gap, such as those given in paragraph 34 of Applicants' specification for materials that consists essentially of the specific semiconductor materials mentioned, but does not have a band gap of a particle-in-binder (PIB) material as taught by Harel (See page 4, lines 1-3 of Harel). Moreover, as know in the art, a semiconductor material that consists essentially of a semiconductor material, may be formed by various techniques including chemical vapor deposition (CVD), sputter, and ion beam

deposition (e.g., as noted in paragraph 35 of the Applicants' specification as filed), but are not formed of particles of semiconductor material mixed with binder material as taught by Harel (See **Figures 12-13** of Harel contrasting the sensitivities of PIB semiconductor materials as compared to CVD semiconductor materials).

For instance, it can be appreciated that the particles of mercuric iodide powder, wet with the binder in a homogenous mixture of Harel will not dry to form a semiconductor material that consists essentially of a semiconductor material. Although the PIB composite may include, on occasion, attached halide particles at various locations, the material will also include binder which has an essential significance to the semiconductor material by effecting its band gap and conductivity. For instance, Harel teaches a binder, such as a Polymeric Binder as part of the imaging composition existing in a radiation detector plate (see Harel page 4). Thus, binder will exist between some of the semiconductor particles within the plate. Hence, it is not disclosed or necessary that the PIB material be a semiconductor material that consists essentially of a semiconductor material because the binder material will exist at locations between the particles of Harel.

Moreover, to this end, Harel teaches that PIB semiconductor materials provide different conduction sensitivity than physical vapor deposition (PVD) semiconductor materials (e.g., PVD materials, without limitation thereto, are an example of a semiconductor material that consists essentially of a semiconductor material) (see Harel pg. 14 paragraph 3; and Figures 6, 12, and 13). This difference in conduction is one motivation behind the invention of Harel. Specifically, the Patent Office has not identified and Applicants are unable to find any disclosure in Harel of binders that include conductive or semiconductive material (see, Harel, pg. 19, last para. through pg. 18, first para.). For instance, Harel teaches polystyrene in toluene mixed thoroughly with mercuric iodide powder to obtain a homogeneous mixture (see, Harel, pg. 20, lines 6-7). As a result, Harel teaches non-conductive binder existing between the particles along the junction of Harel. Hence, for at least the reasons above, the reference does not teach or suggest the limitations above, and Applicants respectfully request the Patent Office withdraw the rejection of claim 1 above.

Also, the background of Harel indicates that single crystal or polycrystalline semiconductor structures (e.g., which without limitation thereto, are a type of semiconductor material that consists essentially of a semiconductor material as

claimed), have disadvantages which the PIB composite improves. Thus, Applicants believe that upon reading the background and other sections of the specification of Harel, a practitioner in the art would not be motivated to create the semiconductor material that consists essentially of a semiconductor material claimed in Applicants' independent claims, since the single crystal or polycrystalline semiconductor structures are what the PIB composite of Harel is designed to replace.

In fact, since the purpose of the PIB composites of Harel is to use the PIB composites in place of single crystal materials or polycrystalline materials (e.g., solid phase semiconductor films) to improve the shortcomings of single crystal materials or polycrystalline materials (see background of Harel), Harel teaches against a semiconductor material that consists essentially of a semiconductor material. Specifically, Harel teaches a radiation detector plate including a composition layer comprising an addmixture of particulate semiconductor with a polymeric binder (see, Harel pg. 4, para. 2), to allow for better direct X-ray radiation to electrical signal conversion that in prior art converters, while having a sensitivity close to the order of magnitude obtained by polycrystalline detector plates and imagers produced by PVD-type processes (see, Harel pg. 3, 1st para. of Summary of Invention Section). Harel also points out that the primary PIB layer has a sensitivity only 40-50% of that of non-composite polycrystalline HgI2-PVD produced imagers (see page 18 paragraph 3 and Figure 6).

Thus, Harel distinguishes its PIB composite from a semiconductor material that consists essentially of a semiconductor material, and identifies its PIB composite as an improvement to those materials, although less sensitive. Specifically, at page 2 paragraph 1 Harel described that composite imagers, such as imagers made of a composite of particles and binders (*e.g.* PIB imagers, see page 4, paragraphs 1 and 2) are different than physical vapor deposition (PVD) imagers of the same semiconductor, and that the PIB invention allows for better direct X-ray radiation to electrical signal conversion (see page 3, paragraph 1 of Summary of Invention). Thus, the composite imagers of Harel teach PIB type imagers which Harel distinguishes from and teaches against compound semiconductor material that consists essentially of a semiconductor material, such as those claimed in amended claim 1 (also see Harel Figures 6, 12, and 13).

Hence, for at least the reasons above, including the reason that Harel teaches against the limitations above of claim 1, Applicants respectfully request the Patent Office withdraw the rejection of claim 1 above.

Applicants submit that dependent claims 2-9, 14, 16-18, and 20-29, being dependent upon allowable base 1, as amended, are patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 2-9, 14, 16-18, and 20-29 as being unpatentable over the cited references.

Also, in addition to the reason above, Applicants submit that dependent claim 18, as amended, is patentable over the cited references for at least the reason that the cited references does not teach or suggest each of the first and second semiconductor materials consist essentially of a semiconductor material, as required by claim 18. An argument analogous to the one above with respect to claim 1 applies here as well. In addition, having each of the materials of the heterjunction consisting essentially of a semiconductor material creates the junction response that Harel teaches away from.

Next, Applicants respectfully disagree with the rejection above and submit that independent claims 30 and 31, as amended, are patentable over the cited references for at least the reason that the cited references does not teach or suggest a semiconductor material that consists essentially of a semiconductor material, as required by those claims. An argument analogous to the one above with respect to claim 1 applies here as well. Hence, for at least the reasons noted above with respect to claim 1, Applicants respectfully request the Patent Office withdraw the rejection above for independent claims 30, and 31.

In addition, Applicants respectfully traverse the Patent Office's assertion that the claimed differences in conductivity type and band gap of claims 16-17 is an inherent teaching of Harel, because of the material properties, and respectfully requests the Patent Office cite a reference in support of those positions in accordance with MPEP § 2144.03. For instance, the PIB materials of layers 4 and 5 of Harel may have conductivities or have band gaps other than those claimed in claims 16-17. Hence, for at least this second reason, Applicants respectfully request that Patent Office withdraw the rejection above of dependent claims 16-17.

Applicants submit that dependent claims 32-37, being dependent upon allowable base claims 30 and 31, as amended, are patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 32-37 above.

III. Claims Rejected Under 35 U.S.C. § 103

The Patent Office rejects claims 10-13, 15, and 19 under 35 U.S.C. § 103(a) as being unpatentable over Harel. To render a claim obvious, all elements of that claim must be taught or suggested by at least two properly combined references.

Applicants respectfully disagree with the rejection above and submit that dependent claims 10-13, 15, and 19, being dependent upon allowable base claim 1, as amended, are patentable over the cited references for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection to dependent claims 10-13, 15, and 19 above.

In addition, Applicants respectfully traverse the Patent Office's assertion that although Harel does not disclose the specific limitations of claims 10-13, 15, and 19, that those ranges would be obvious to a practitioner in the art from the thicknesses for lead iodide provided on page 31 and for an embodiment including mercury iodide, but not lead iodide on page 29 and requests that the Patent Office cite a reference in support of that position in accordance with MPEP § 2144.03.

Specifically, at pg. 29, Harel teaches example 14 having a detector plate with a final thickness of 150 microns, but does not teach a specific thickness of either a first or second semiconductor material layer. Then, on pg. 31 Harel teaches a 200 micron thick layer of lead iodide PIB paste in a detector plate having an overall thickness of 400 microns (see, Harel pg. 32). Thus, the 200 microns thick of lead iodide of pg. 31 cannot be combined with the 150 microns final thickness detector plate of pg. 29, because the lead iodide layer is thicker than the entire detector plate of pg. 29. Finally, fig, 15, referred to on pg. 31 of Harel teaches equally thick detector layers each having a thickness of 300 microns. Thus, at pg. 31 Harel does not teach layers having different thicknesses, but instead a way with fig. 15. Moreover, none of the teachings of Harel include a thickness less than approximately 50 microns (see, Applicants' claims 10, 13

and 15). Nor does Harel teach a first semiconductor material of lead iodide and a second semiconductor material thicker than the lead iodide (see, Applicants' claim 11), because Harel does not teach or suggest a layer thicker than the 200 micron thick lead iodide layer of example 15 or the 300 micron thick lead iodide layer of fig. 15.

Moreover, Applicants assert that the thickness limitations of dependent claims 10, 13, 15 and 19 would not be obvious to one of ordinary skill in the art because those ranges provide benefits for a detector having the same sensitivity with less thickness, such as to provide a more efficient detector having a same thickness, by mixing a thick layer of mercuric iodide with one or more thinner layers of lead iodide, where the thinner layers of lead iodide protect the contacts (see paragraphs 5 and 33 of the application as originally filed). Most specifically, the ranges in those claims provide an embodiment, for example without limitation thereto, of a thinner layer of lead iodide (*e.g.* such as 50 microns of lead iodide for claim 10, 13 and 15). One or both sides of a thicker layer of mercuric iodide (*e.g.* such as a 250 micron thick layer of mercuric iodide for claims 11-13 and 19). The thin layers of lead iodide provide protection from the mercuric iodide for the contacts; and the thicker layer of mercuric iodide provides more sensitivity and mobility (see paragraph 27 of the application as originally filed).

For at least these additional reasons, Applicants respectfully request that the Patent Office withdraw the rejection above of the dependent claims 10-13, 15, and 19.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the prior art of record and are in condition for allowance, and such action is earnestly solicited at the earliest possible date.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17. If a telephone interview would expedite the prosecution of this Application, the Examiner is invited to contact the undersigned at (310) 207-3800.

Respectfully submitted,

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CERTIFICATE OF FACSIMILE:

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Erin Flynn November 15, 2005